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ABSTRACT

The five essays in this volume represent the contributions of one group of leaders in the application of computers to the teaching and learning of foreign languages and illustrate present and future uses of technology in assisting language learning. Various pedagogical problems and approaches are considered in the papers. They are: (1) "Foreign Language Instruction and the Computer" (Peter C. Patrikis); (2) "Emerging Genres of Interactive Videodiscs for Language Instruction" (Janet H. Murray); (3) "Practical Hypermedia and Hypertext" (David A. Bantz); (4) "Interactive Audio and Computer-Assisted Language Learning" (Randall L. Jones); and (5) "Multimedia and Listening Comprehension" (James S. Noblitt). (Contains 8 references.) (SLD)

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Multimedia and Language Learning

Peter C. Patrikis, Janet H. Murray, David A. Bantz,
Randall L. Jones and James S. Noblitt

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Fourth in a Series
Technology in Higher Education: Current Reflections

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Multimedia and Language Learning

Technology in Higher Education: Current Reflections

Multimedia and Language Learning

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Introduction

Foreign language education is one of the nation's and, thus, the Institute for Academic Technology's educational priorities, and IAT Fellow James S. Noblitt of Cornell University has formed an IAT Foreign Language Advisory Group (FLAG) to address this priority. The members are foreign language scholars who represent a variety of different technologies and vendor implementations. Attuned to the academic politics of foreign language departments in particular, and to the traditionally low level of funding for the Humanities in general, they make the case for increased academic resources for technology-based language materials. They address not only foreign language learning, but also the role of literary and linguistic scholarship in formulating technological approaches to instructional material.

Introductory remarks by Peter C. Patrikis (the Consortium for Language Teaching and Learning) provide a social and pedagogical framework for the other essays from some of his fellow FLAG members. Putting educational priorities ahead of technology, he writes, "We must translate our needs into software, not translate software into new approaches." The discussions that follow outline a variety of pedagogical problems and describe approaches that depend on the new interactive media for an effective educational solution. Examples of multimedia programs are examined in the light of the advantages offered for language instruction. In her essay on the genres of interactive videodiscs, Janet Murray (MIT's Project Athena) analyzes the pedagogical structure of narratives, documentaries, and hypertext and discusses the affective and cognitive relations of content to student patterns of learning. David Bantz (Dartmouth College) explores two examples of the use of hypermedia for language learning that provide access to information not commonly available to students. Randall Jones (Brigham Young University) shows how sound can play a role in the learning of grammar, and James Noblitt (Cornell University and the University of North Carolina at Chapel Hill) suggests how images can enhance listening comprehension skills.

The essays in this volume represent the contributions of

one group of leaders in the application of computers to the teaching and learning of foreign languages. While in no way comprehensive in representing all the activity in the field, they nevertheless are rich in problem solving examples and provoke thought about the educational contexts in which new interactive language tools can be created and applied. They illustrate the present and future uses of technology in service to language learning.

WHG & JSN

Foreign Language Instruction and the Computer

Peter C. Patrikis

New Problems and New Directions

The union of computing and foreign language teaching and learning is a marriage made in heaven or hell. On the one hand, language, in its different forms and under the scrutiny of a variety of disciplines, assumes the major place in the study of the humanities; the teaching and learning of languages constitute a labor-intensive and costly element of college and university budgets; and from the early days, the computer held the promise of facilitating and radically transforming our work in the study and teaching of foreign languages. On the other hand, the humanities do not follow the model of the sciences: they do not benefit from the infusions of external funds. Research in medicine, the natural and applied sciences, and some areas of the social sciences account for some 95 percent of all external funds received from grants and contracts and routinely includes sums of money for the purchase of equipment and for hiring new personnel like programmers. External funding for the humanities has usually been limited to fellowships and scholarships for the pursuit of individual research, and, even now, administrators are known to complain when a new humanist on campus asks for a microcomputer and printer.

The other essays on foreign language computing in this issue are intended to show recent and encouraging directions in the use of computers in foreign language teaching and learning. They reflect the accelerated changes that accompany the use of technology, and they offer insights into how to make the union of computer technology with foreign language study a profitable and provocative one. As our schools, colleges, and universities invest significant resources in technology — resources in the form of money,

time, space, and personnel — it is fair to pause to ask where we are headed.

Computing in the humanities, in general, and in foreign languages, in particular, raises several uncomfortable questions. More than two decades ago, the pioneers in the use of computers in education predicted brave new worlds in which the computer would serve different roles: as a teacher, who delivers information to students; as a tutor, who assists the student in his or her studies; as a tester, who evaluates learning; and even as a student, for whom the human student assumes the role of teacher and to whom the human being conveys the structure and content of the course. It was a heroic vision that looked at the very process of learning in a different manner and that suggested vast sea changes in education, as students young and old miraculously absorbed data and wisdom from the cathode ray tube. The vision of the computer in education carried with it a trenchant critique of the status quo, criticism of the dynamics of the classroom, criticism of the attitude or preparation of the teacher, and criticism of rigid modes of learning. In perfect irony, the dehumanizing classroom of human beings was to be humanized once again by the machine on the desk. It was, perhaps, a primitive vision, a nostalgia for a golden age of education that never existed. The discontent that Americans feel about education found some relief in the hope of the democratic and flexible computer. Fortunately, the possibilities of the computer-assisted instruction had its lighter moment — an early limerick suggested a solution to Greek tragedy:

Word has come down from the Dean
That by use of the computing machine
Young Oedipus Rex
Could have learned about sex
Without ever touching the Queen.

Now some twenty years later, the technology has evolved with dizzying speed, and the promise of the mainframe computer has been passed on to the microcomputer. But the computer has not yet caused a revolution in education.

Indeed, the last ten years in the United States have been witness to a series of constant and sharp attacks on the system of failures of education in the American high school and in colleges and universities, and these reports have expressive, threatening, almost apocalyptic titles: *A Nation at Risk* or *The Closing of the American Mind*. Reports like these hark back to what they consider better days, when the study of the Classical languages and literatures of Greece and Rome was the ideal, or else they point forward to the days of increasing economic competition with that ominous geographical entity dubbed the Pacific Rim. Curiously, none of the recent famous or infamous laments on education mention the use of computers as part of the process of education. How have we been able to go so quickly from the promise of the pioneers to the silence of the critics? On one level, the pace of the development of the technology itself poses an impediment to the application of computers to teaching and research. Hardware and software change with remarkable speed. To rephrase an old saying: Here today, obsolescent tomorrow. What are we to make of a technology that by the month leaves us progressively ignorant or out of date? Do you remember CPM? How many versions of DOS have we all learned? How many of us are getting ready to abandon our current operating systems for one of the versions of UNIX? As Apple prepares to launch System 7.0 with the upgrades of hardware and software it will require and as IBM affirms its commitment to OS/2 while Microsoft is committed to Windows 3.0, no one is remiss in asking, What next? The pace of change has caused some administrators, those who hold the strings to the purses, to ask: "How can we spend so much money for equipment that will be virtually out of date as soon as it is installed on campus?" In a sad irony, progress in one direction becomes a deterrent in another direction, and innovation helps to preclude innovation.

The intellectual possibilities induced by the electronic processing of words, texts, sounds, and images have created new expectations and new hopes, and they have at the same time provoked new problems. There are a host of administrative problems. New equipment requires new space, maintenance, security, supplies, new personnel, or newly trained

personnel, and it is, in many institutions, putting significant pressures on administrators to rethink and to reorganize the use of resources. These are not fat times, and any responsible administrator will think twice about a major capital investment in equipment, particularly for departments that do not bring significant external resources into the university. That administrator will also consider the costs of developing materials for use on the computer. As many donation programs have demonstrated in the past, the mere deposit of equipment on campus does not guarantee the development of exemplary applications, tools, and materials. This is not the occasion to rehearse the academic system of governance of our colleges and universities that places professors of literary theory and criticism or linguistic theory at the top of the academic hierarchy — near the pot of gold — while teachers of languages labor at the bottom of that hierarchy. In other words, the academic system is not set up to achieve ideal results. Yet, it would be simplifying the situation to suggest that the mere redistribution of capital and labor holds the answer to all the problems.

In addition to these administrative problems, there are intellectual problems. Much of what has been accomplished thus far in foreign language computing has often been narrowly conceived, poorly focused, limited in use, and — most important — unallied with theories of foreign language acquisition. Unfortunately, experience has shown that the computer is so adept at allowing one to put together and express one's thoughts that it immediately exposes weak presentations, careless integration of materials, and mediocrity of thought. The problem lies not with the computer, but with our understanding of how adults acquire a second language. For computers to become effective instruments in the teaching and learning of languages, we must be sure of what we are trying to accomplish, but the status of language learning is unclear. Is language an intellectual discipline like physics or formal logic? Is language a body of cognitive knowledge like Dutch painting of the seventeenth century or symbolist poets of nineteenth century Europe? Is learning a language a technical skill like surgery, typing, or singing falsetto? Or does language learning involve some perplexing

combination of all of these? Moreover, even if the status of language learning were clear, there is much debate and confusion about the goals of language instruction. Are students learning a second language as an integrated aspect of a general education program? Are they learning primarily to read great books or to do research in a specific discipline? Are they learning to speak and listen for pleasure, for business negotiations, for medical or social work? While goals can overlap, they push and pull in widely differing and demanding ways. We need to discover ways of exploiting technology based upon our understanding of foreign language acquisition, based upon students' needs, and based upon a consensus of the goals of instruction. We must translate our needs into software, not translate software into new approaches.

Thus far, much activity in computer-assisted instruction in foreign languages has been devoted to variations of fill-in-the-blank exercises. Drill exercises that solicit, for example, the simple past tense of strong German verbs like *fahren*, *sprechen*, or *ziehen* or otherwise examine the morphological peculiarities of a language perhaps merit their nickname, "Drill and Kill." The isolated fragments of language that we often find in such drill exercises are divorced from a communicative context. They are not meaningful utterances, and students find them boring. We are seldom called upon in life to produce random examples of the imperfect subjunctive in Italian. Instead, we use periphrasis, we seek alternative locutions or alternative means of communication like gesture. My point is not simply to deride drill exercises. Computers must present what every good language teacher knows: learning a language is more than mastering its lexical, grammatical, and syntactical parts. The negotiation of meaning involves considerably more than decoding or deciphering a text or more than assembling individual words in correct form and order. The machine on the desk is, after all is said and done, just a tool. To use a tool effectively, we have to know what we want to do as well as how to do it.

It is sufficient to say that the range of essays on foreign language applications in this issue only begins to suggest the complex issues involved in computer-based foreign language teaching and learning, but those suggestions are

beginning to lead to a clearer understanding of what might constitute the ideal foreign language workstation. That workstation, which would serve the needs of students, teachers, and researchers alike, would be a powerful, fast system for the processing of sound, text, and image. Equipped with fonts for many languages at the system level, this foreign language workstation would have a complex system of online reference tools:

- a grammar (with a natural language parser),
- a collocutionary lexicon (where words are defined in semantic fields and according to actual usage) in English and in the target language,
- a true dictionary (that employs sound, that is, real diction),
- a pictionary (a database of still and moving images).

It would also include applications for the analysis of text at the grammatical, syntactical, phonological, semantic, and sociolinguistic levels.

A discussion of the foreign language workstation will tend to force useful and difficult questions. What does it means to acquire vocabulary? What is the function of the drill-and-practice method? How do we know what certain learning strategies can do? What does it mean to learn a language? The computer offers teacher and researcher in foreign language acquisition a unique opportunity to examine such questions invisibly, to follow the process of learning at the keyboard, and to attempt to make sense and useful decisions about a student's activity at the machine. Moreover, the computer is allowing us to re-examine foreign language pedagogy. With hypermedia and multimedia we move away from the simple world of discrete-point instruction, the world where one word translates another word and where we fill in the blanks. And we move to a far richer and more complex domain of understanding the broader picture, where context creates meaning. The very goals of language study shift from achievement (the mastery of paradigms) to understanding and communication. Most challenging of all, the computer

enhances the value of the classroom and the exchange between students and between teacher and students.

Finally, the computer can serve as a new and useful medium of communication beyond our current norms of instruction. An experimental French course directed by Judith Frommer at Harvard University and John Barson at Stanford University engages students in computer-mediated communication using electronic mail on BITNET. The students have been producing journals consisting of articles about the two different universities, submitting drafts and final versions to one another across the continent. This project employs all the features of successful second language acquisition — authenticity, collaboration, function, structure, grammar, vocabulary, and style — and succeeds in motivating students to new achievement. Not only writing skills improve, but oral/aural skills also improve because of the excitement and challenge of discussing messages from across the country and of producing a document for publication. The project expands the environment of language teaching and learning. Students are able to work via modem at computer stations, in their own rooms, or in the teachers' offices during consultation hours. They work individually or in groups, calling upon one another in one city or the other for assistance. This project is therefore remarkable, not only because it leads to increased learning, but also because it suggests a new ethnography of the classroom and redefines, in a highly effective manner, the role of the computer in language learning.

Initiative and creativity in foreign language teaching and learning must be social skills. No one can go it alone. The challenges are too great, the costs too high, and the workload too daunting. In the past few years, leading efforts in foreign language education have demonstrated that collaboration yields more than competition. As our basic premises about what the computer can accomplish change, so do our own assumptions about how we work efficiently and effectively.

Emerging Genres of Interactive Vidoediscs for Language Instruction

Janet Murray

Although work on interactive video for language instruction is still in its pioneering stages, several distinct genres are emerging and instructors are making clear their criteria for successful discs. It will take years of use and focused research to establish reliable criteria, of course, but enough design, preliminary testing, and discussion have now taken place to begin to formulate some common assumptions about successful use of the medium. In particular, interactive videodisc (IVD) has been seen as a means of extending communicative language learning by fostering task-centered interactions with a linguistically rich and authentic environment. (Murray, Morgenstern, and Furstenberg 1988)

General Criteria for Language Instruction on Interactive Video

Although interactive video as an educational medium is still in its formative stages, key projects have begun to explore the field and establish conventions for use. In response to these prototypes, language teachers engaged in testing or designing new systems have expressed strong preferences for the kinds of material they want to see emerging in language learning in coming years. Based on the expectations of teachers, videodiscs are more likely to be effective when:

- Learners are offered authentic languages spoken among contemporary speakers in their native environment.
- Learners are given clear tasks to perform that involve them in the video.

- Learners are given control of the video with ample textual aids.
- All subtitling is in the target language, with simplified language for glossary.
- Transcriptions and subtitles offer annotations to indicate the differences between spoken and written language (e.g., [ ]s to indicate elision)
- Learners in the same class are given different experiences to compare. This, in turn, motivates the students to use the target language in order to effect real exchange of information.
- Video covers a variety of age groups, social classes, and degrees of intimacy.
- Video sequences are short (roughly three minutes at maximum).

Many of these criteria are in harmony with the cognitive research on second language acquisition which stresses exposure to a wide range of correct utterances in order to closely simulate the language environment observed in first language acquisition. (Flynn in press)

Few videodiscs have been produced and studied in classroom use. MIT's *A la rencontre de Philippe* is currently in beta test, and among the findings from the formative evaluation conducted with that disc is that students use the materials in different learning styles (Brownfield 1990):

- Look before leap: intense, painstaking use of online helps before making any moves.
- Leap before look: minimal use of online helps, consultation of the helps as needed during play, much guessing and work by trial and error.

One of the goals of future videodisc development should be to encourage more of the students to follow the leap then look pattern — to try to master language in context and to be comfortable with less than complete comprehension in order to concentrate on using language in a goal-centered way. Because the medium captures process, it should be the ideal

environment in which to address the difficulties of encouraging students to adopt a learning style that will make them more aggressive and flexible language learners in everyday life and to enhance full integration of the three knowledge bases available to adults and central to second language acquisition.

The Three Genres of Interactive Video for Language Learning

Three principle genres of interactive video for language learning are emerging as significant for future development.

Interactive Narrative

From the point of view of communicative and task-centered language learning, interactive narrative is most effective under the following conditions:

- The language is scripted by a native speaker living in the culture at the present time.
- The learners' actions affect the plot of the story.
- The menus offer not right/wrong but exploratory choices.
- Learners are encouraged to make observations and take actions on their own.

The advantages of interactive narrative as a medium for language learning include:

- The ability to script the discourse to include different situations, social classes, intimacy levels.
- The students are motivated by the story elements and by their own participation in how the story develops.

The disadvantages of interactive narrative as a medium for language learning include:

- Scripted speech is not the same as natural speech: it can be clearer but it lacks redundancy and authenticity.
- Scripted narrative is much more likely to draw on cultural stereotypes and to imitate genre narratives like television sitcoms.
- Narratives are less useful than documentaries because they are more linear and single-purposed.

It is crucial that the plot of an interactive narrative provide ample opportunities for students to become active participants in the language learning situation. At the same time, situations should not be so melodramatic that they distort or trivialize the culture described or distract from the learning task. The plot should offer opportunity for multiple communicative situations.

Point of view is an important consideration in making narrative videodiscs. The audience can be placed in the role of invisible viewer of an interaction, or an active agent in the story, or the companion and advisor of a protagonist. As in written fiction, it is aesthetically preferable to keep point of view consistent. The multiple realities suggested by the interactive form, however, cry out for narratives in which point of view could shift according to the student's preferences. Furthermore, it may be more desirable from an instructional frame of reference, to allow a first person point of view narrative (i.e., one in which the actors speak directly into the camera to the student, and the camera records the student's angle of vision) to veer off now and then into third person scenes (i.e., scenes in which the student is in effect invisible) in order to present authentic interaction between two characters in an intimate setting.

Ideally, perhaps, the student should become involved in the interactive narrative by being asked to play a role. Of course, this role involvement can be difficult to manage since the students will vary in sex, age, and cultural backgrounds. The fictional role must be loose enough to accommodate these differences. Ideally, students should be able to play roles within a fictional world that offer a wide range of char-

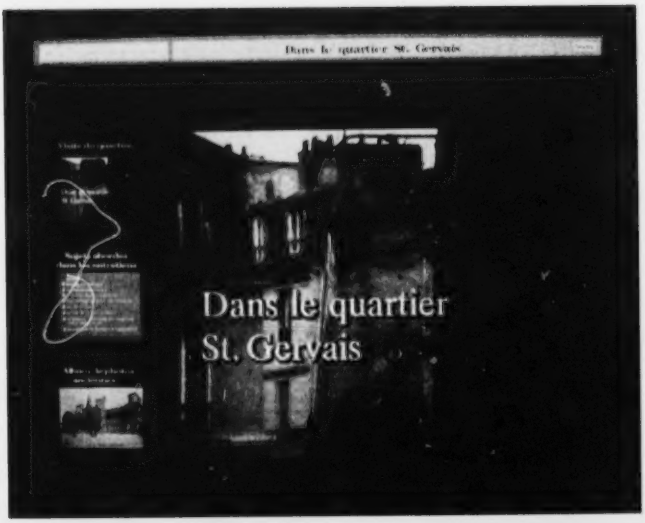
acter traits and a wide decision space so that they can feel comfortable within the world. Narratives that ask students to role-play must be particularly sensitive to avoid offensive situations and bolster unfamiliar cultural behavior with appropriate explanations.

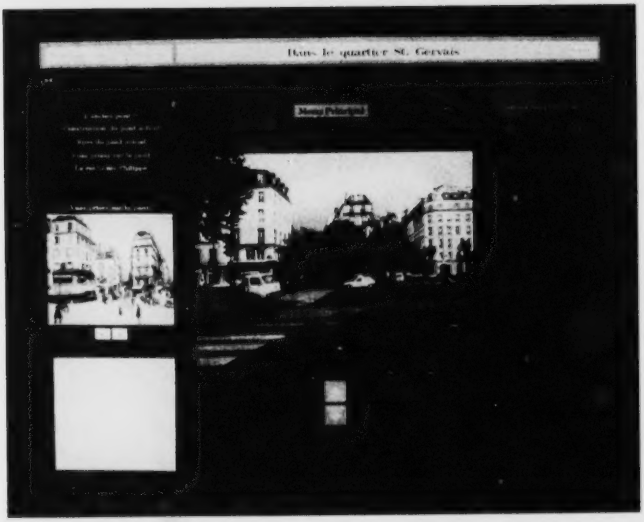
The interactions possible in a narrative videodisc exercise depend on the capabilities of the systems in use. The most obvious interaction is answering a question of the character on the screen who addresses the student as if he or she were present in the screen by looking into the camera. The student can answer by menu choices in the simplest systems. More advanced systems could accept typed-in answers, but the amount of computation necessary to analyze the answer may not be worth the effort. Menus can be used to model many uses of the language. One can even include more choices than there are branches (i.e., several choices go to the same branch) for the purpose of modeling language.

Other kinds of interaction include leaving notes or simulated phone messages (through audio recording or keyboarding) for protagonists; taking actions that affect the story such as opening a letter that is later found by the protagonist; going to different locations in the fictional world; choosing to follow one character or another at key decision points; and so forth. Working simulated objects such as the telephone and answering machine in *Philippe* help to concretize the illusion. One goal of all of these interactions should be to increase the psychological reality of the fictional world in which the student is operating.

Interactive Documentaries

The second major genre of the interactive videodisc is the documentary. Although there have been several documentaries adopted from linear broadcast material for interactive use, the field of interactive documentary for language learning is relatively unexplored. The MIT disc *Dans le quartier St. Gervais* (under development) is the most complete example. One key advantage of documentaries is that they can be used at any level of learning, from beginner to advanced simply by varying the task with which the learner is sent to the





In *Dans le quartier St. Gervais*, produced by Project Athena at the Massachusetts Institute of Technology, students listen to and watch inhabitants of one Parisian *quartier* speak about their lives in their neighborhood. Provided with access to subtitles, glossary, cultural

notes, historical slides, and annotations, students can move freely around the disc by interview topics, map location, multiple indexes, or they can take a walking tour of the neighborhood, stopping to explore when the computer alerts them to an interesting location.

disc. For instance, a beginning student might be sent to an interactive documentary to find the price of a room in a youth hostel or the names of three stores that sell food. An advanced student, on the other hand, might be asked to prepare an essay or re-edit a mini-documentary contrasting the attitudes of various interviewees on gentrification. The tools each student would use would be exactly the same.

Documentaries are a kind of data bank. They offer more natural speech than scripted narratives, but they are harder to shape. The ratio of usable material to minutes shot is very high, and, therefore, video is the preferred medium. In choosing subjects for documentary work, it is important to pick issues that are multisided and people who have significant things to say to one another. Because of the repetition involved in mastering a language, it is all the more important to avoid uninvolving sequences. Segments can be cross-referenced so that students can collect information on a topic and compare different people's reactions to the same questions or issues.

Documentaries presented in an interactive medium can be a tool for combatting stereotypes, if properly prepared. The medium itself encourages the juxtaposition of differing attitudes and social groups, and the fact that people are presenting themselves to some extent (the filmmakers are really in control, of course, through selection, editing, choice of questions, etc.), helps to make the material more authentic and less distorting. However, the grammar of broadcast interviews should be avoided, whenever possible, in favor of the style of nonintrusive interviewing taken by the most serious documentary filmmakers.

Just as the plot is crucial to the development of interactive narratives, the choice of organizing structure is crucial to the development of interactive documentaries. Too narrow a framework will cause the material to become dated and perhaps even boring. Too wide a framework will give the students no paths to follow in any depth. To get the right width and depth to the material requires the establishment of a domain of investigation (e.g., one neighborhood) and of overlapping themes within that domain (e.g., gentrification, relationships between the generations, historical events in the

neighborhood). The database should be rich enough for students and teachers to make connections and observations not foreseen by the developers.

Interactive documentaries are, therefore, most effective when:

- They are unobtrusively filmed.
- They let a variety of social groups represent themselves.
- They engage issues of controversy and historical resonance.
- They include a variety of speakers in terms of ease or difficulty of comprehension.
- They include facilities for students to edit their own mini-documentaries.
- They are accompanied by workbook exercises (online or not) appropriate to different levels of language mastery.

Interactive documentaries have these advantages for language learning:

- They offer authentic speech of multiple speakers.
- They can be used by students at different levels with the same tools.
- They can offer a wider perspective on the society from touristy to historical to personal issues, while still maintaining the integrity of the whole.
- They are unified in domain and offer thematic depth.

The disadvantages of interactive documentaries are:

- If material is too topical and not of historical interest, it may become dated very quickly.
- The lack of scripting makes it harder to cover particular grammar, vocabulary, or communicative functions.

- They are expensive and time-consuming to produce, demanding a high ratio of video shot to useful footage.
- They risk diffuseness and boredom because they are dependent on unity and interest to emerge from spontaneous events.

Hypertext/Hypermedia

Hypertext is the third form emerging from interactive videos developed for language learning. In a hypertextual (or hypermedia as it is often called when video is added to textual material) structure, students are given multiple points of access to the same material and multiple potential paths through the material. For instance, a narrative or documentary videodisc might be hypertextually indexed so that teachers could present all the occasions in which characters greet one another or use the expression "Bon." Multiple indexing could take a student to an interview by way of map but allow him or her to leave by map, footpath, or thematic menu (which would display other interviewees who speak to the same topic). Hypertext lets teachers mine a disc for all the different levels of linguistic information, and allows for explanatory notes on all the following levels as well: linguistic structures, discourse patterns, and communicative strategies. It can provide different mini-databases for use by different age groups or people with differing first languages. The hypertextual approach builds on videodiscs as repositories of information.

Hypermedia can also be used more simply, without the elaborate cross-indexing characteristic of hypertext, to provide access to video illustrations of textual issues or to provide a simple video database. This is a promising means of presenting communicative functions, but it is perhaps best combined with a disc that includes larger segments of meaningful dialogue.

Hypertextual organization is desirable then when:

- There are multiple paths through the material.

- The material is deep enough to support significant pathways.
- Assignments or classroom work maximize the use of the pathways.

Hyptertextual organization possesses certain advantages:

- It allows multiple use from the same materials.
- It can be used at a variety of levels with the same tools of access.
- It offers a particularly promising approach for teaching grammar with communicative functions presented in cultural context, since it allows you to access part of a sequence along with its original integrity of context.

Hypertextual organization can lead to certain disadvantages:

- It can encourage a compiling of brief fragments which then distort the learner's view of the materials presented.
- It is notorious for navigational problems, if poorly designed.
- It lacks the story interest that motivates interactive narrative, and they do not allow learners directly to govern the action as they can in an interactive story.

Above all, hypertext offers the potential for isolating and coordinating the different knowledge bases — linguistic and otherwise — that students must draw on and develop in order to become successful language learners. An appropriate language learning hypertextual organization will acknowledge and exploit the complexity of language, offering students access to each separate area of competence and allowing them to integrate the different language areas.

The range of genres is only limited by the imaginations of the people who come to work on developing interactive video for language learning. In order to assure maximum useful-

ness of the medium, it is necessary that authoring systems be developed that make it easy for teachers themselves to select, assemble, and annotate video segments so that they may experiment with differing modes of presentation. For this purpose, existing materials can be very useful, such as broadcast videos on videodisc and foreign films (although they are unfortunately often subtitled in English). Great films, of course, are worthy literary objects in themselves and are at least as desirable as objects of language study as great literary texts. Such films offer less opportunity for interaction, but they offer greater aesthetic and intellectual rewards than language discs. Works of popular culture are another matter, however, and must be handled carefully in order to make students aware of the stereotyping and distortions that are an intrinsic part of popular media.

Practical Hypermedia and Hypertext

David A. Bantz

Many language faculty have long seen the appeal of technology, which has, in theory, made it possible to offer the learner the multiple channels of perception and the immediate feedback of individual instruction. Too often, however, technology has been applied to instruction in simplistic and repetitive ways. One-dimensional instructional tactics such as programmed learning and the listen-and-repeat ritual of the conventional language laboratory have frustrated students and professors alike in their attempts to deal with the complex array of skills involved in language learning. Technology is becoming available for use in the classroom that has the potential for enhancing — perhaps even dramatically altering — foreign language instruction. We now have the technical means to provide computer-mediated environments in which language students can learn by simultaneously listening, viewing, reading and writing, and, to a certain extent, speaking.

In this section, aspects of the emerging possibilities based on practical hypermedia are presented. The focus is narrowed by both words of the expression "practical hypermedia." First, hypermedia — that is, material in various media, including text, sound, and visual material that is available through association rather than linear presentation — is considered here as a technique for providing the multidimensional linguistic learning environment we want. Second, we emphasize what is currently feasible using modest resources to deliver applications that address specific aspects of language learning on workstations widely available to both instructors and students.

Exploiting the full potential of current technology and incorporating each advance in that technology are going to require an investment in computing and related technologies; more importantly, some fundamental rethinking about

the ways in which we make resources available to foreign language learners and the ways in which we structure that information will be required. The basic technology now exists which makes it possible to provide students of language with rich, exciting, and unregimented electronic environments. But we are only beginning to explore practical applications of such power and have hardly begun to recast such tools as the dictionary, the dual language glossary, the drill, and the listening tape into their electronic counterparts. The examples about to be discussed are intended to serve only as suggestive starting points for this process of transformation.

A Multimedia Lexical Database

Hanzi Assistant is a multimedia database of Chinese characters, or *hanzi*. Designed to assist in learning Chinese, it contains the 2,500 characters of the "basic literacy set" as specified in official publications from China. Each *hanzi* is represented in several ways: as written with traditional brush pen; as written with pencil or ball point pen; as an animation of writing in correct stroke order; in Pinyin — a phonetic representation in Roman letters (as *bào*); orally in both male and female native Beijing pronunciation; and in English translation. (See Figure 1.)

Each of these aspects represents important (if somewhat atomistic) dimensions of the language. Traditional brush-pen characters are significantly different from more stylized representations in print or those written with a ball point pen or pencil. Pinyin is not only a phonetic representation, but an important alternative means of communicating, particularly in mixed western/Chinese contexts. Unlike European languages, Chinese has tones that are an integral component of pronunciation. To allow students to begin to discriminate tones — and distinguish tone differences from pitch — we both mark the tones on each Pinyin and provide clear digitized native speech by both male and female speakers.

The system of writing developed in the People's Republic of China has simplified some traditional *hanzi* and, in some

Figure 1

cases, represented a group of traditional *hanzi* with a single character. Our database includes both the simplified and corresponding traditional forms. Users may choose (in a "Preferences" menu) to view only the characters in the simplified system, only those in the traditional system, or all characters. In addition, a button on each card indicates for each *hanzi* whether it is unique to the simplified system (i.e., is a "simplified" *hanzi* or represents multiple traditional characters), or is unique to the traditional system (i.e., is represented by a different *hanzi* in the simplified system), or is common to both systems. If you click on this button, the corresponding *hanzi* in the other system is shown. The total database is 3,500 visibly different *hanzi*.

The tools to develop this multimedia lexical database were relatively straightforward: Farralon's *MacRecorder* to enter sounds, a scanner to enter images of *hanzi*, and a digitizing tablet for writing the pen-stroke characters. The programming was primarily in *HyperTalk* with a few extensions written in C. As we extend this database to *kanji* for Japanese, we will extend the functions by including a variety of indices

rather than the simple Pinyin index in this database, and by including sample compounds and phrases for each *kanji*.

While readily available technology can, as in this example, facilitate the development of very specific tools to meet perceived needs, their very specificity prevents their use as part of a generic environment. The specific solutions of *Hanzi Assistant* would be inappropriate for most other languages; major additional features, such as providing examples of compounds or phrases, will require substantial reworking of the software. This we believe is typical of specific pedagogical uses of multimedia. Yet, a database, such as the one described, obviously would have its highest and fullest use if it were integrated into a more general environment which could facilitate many uses, and which could have its content gradually evolve with contributions from many sources.

A Schema for Interactive Reading

The next example shows how we are attempting to address the problem of bringing together various components for foreign language learning. One step toward the integration of tools into a more general environment is to make electronic texts (in the broadest conception of that term) interactive with dictionaries or annotations explaining portions of the text.

It is now commonly accepted that electronic dictionaries and other lexical aides provide important advantages over their ancestral printed analogues. Essentially, printed references provide a single direct indexing scheme (i.e., alphabetic order of main entry words in a dictionary or standard dual-language glossary) while electronic reference materials may be indexed and accessed equally well in an indefinite number of ways (e.g., by date of earliest cited usage, or etymological origin, or root form). How can these supposed advantages facilitate language learning? The flurry of interest and activity in hypertext applications based on *HyperCard* and its cousins (*Guide*, *SuperCard*, *ToolBook*, and others) has suggested a hypertext environment to provide

the links between texts, and between portions of a text and general references.

For the beginning language student reading a foreign-language newspaper, for instance, presenting the newspaper text on the screen in conjunction with an instantly accessible online dictionary can make the requisite looking-up of words and decoding of syntax almost effortless. A multidimensional electronic environment developed imaginatively could provide students with the motivation to explore and learn independently, freed from the limitation of having just the tape, or just the dictionary, or just the library.

Dartmouth's prototype for such an environment provides a uniform interface for hypertext links to other documents, multimedia links, reference lookup, annotations. It is an extensible environment in two important ways:

1) Texts in this environment are not "captured" into a special format; instead any plain text file may have such links, without altering the text or its file format. This means that any plain text file at all may become part of this environment, and still be available for use by any other software which uses plain text files. (See Figure 2.)

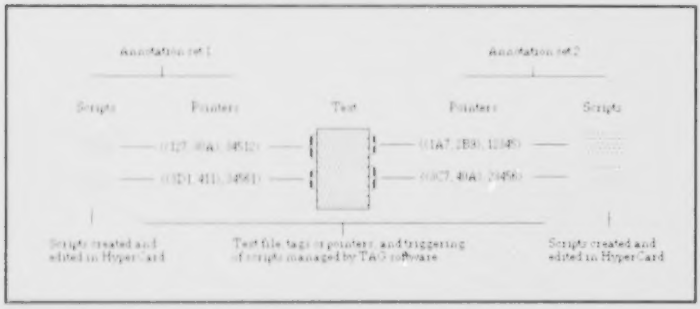


Figure 2

2) Instead of creating links directly between files, we use *HyperCard* as an intermediary; each link triggers a script. Consequently, anything which can be executed using *HyperCard* scripts can be the end point of a link. Predefined types of links exist, such as to another plain text file, or to digitized audio or videodisc, but users are free to extend these to include anything they care to create. These bits of idiosyn-

cratic or text-specific material nevertheless exist as isolated pieces of a much more general environment. This software — *TAG* — is described more fully in "A Unified Model for Text Markup, Interactive Reference, and Multi-media," forthcoming in proceedings of *The New Medium*, the 1990 ACH/ALLC Conference.

This environment is part of an ongoing research project funded by the Sears Foundation and the Consortium for Language Teaching and Learning to enhance foreign language instruction by using information technology to increase authentic language materials in the curriculum. Materials using this scheme are currently being prepared in several languages, including German, Greek, and Russian.

Figure 3 illustrates the use of still images and a glossary to augment a text. Passages or phrases for which either an illustration or note is available are marked with a vertical bar in the margin; these are created automatically in the authoring mode as text is selected and a link created; these marginal notations are automatically repositioned as the text is edited or reformatted.

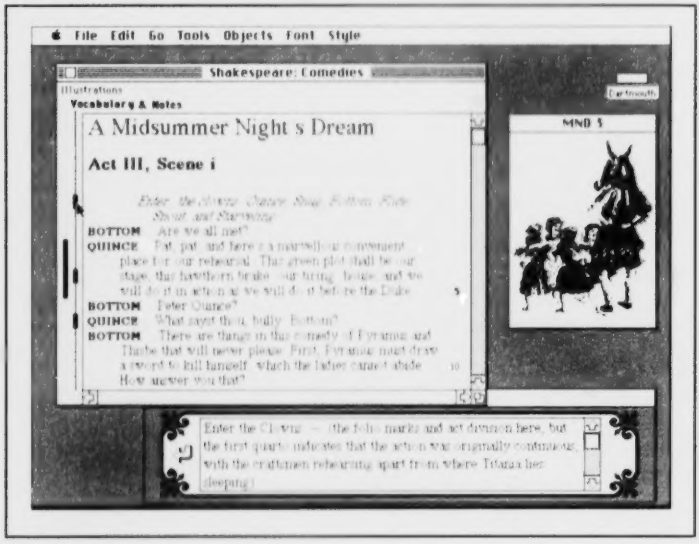

File Edit Go Tools Objects Font Style
Shakespeare: Comedies
Illustrations
Vocabulary & Notes
A Midsummer Night s Dream
Act III, Scene i
BOTTOM Are we all met?
QUINCE Pat, pat; and here s a marvellous convenient
place for our rehearsal. This green plot shall be our
stage, this hawthorn brake our tiring house; and we
will do it in action as we will do it before the Duke.
BOTTOM Peter Quince?
QUINCE What sayest thou, bully Bottom?
BOTTOM There are things in this comedy of Pyramus and
Thisbe that will never please. First, Pyramus must draw
a sword to kill himself; which the ladies cannot abide
How answer you that?
Dartmouth
MND 5

Figure 3

Readers click on the marginal bar to activate the link. The exact phrases for which links have been created may be indicated by clicking on one of the named sets of links; anchor phrases are indicated by a dotted underline in the text. (Incidentally, despite the displayed formatting, this is a plain text file; formatting information, as in the case of the hypertext links, is stored separately from the text.)

As a substantial quantity of material becomes available in this format and as we move from glosses to more sophisticated algorithms to access general references, we envision the evolution of this scheme to support advanced language courses and to meet the needs of scholars for creating and presenting critical editions.

What Next?

These and other examples illustrate not merely the possibility but the practicality of hypertext as a medium to enhance language learning. "Practical" here means:

1) significant applications can be developed by faculty-programmer teams without turning faculty into programmers;

2) academic and pedagogical concerns (rather than technical considerations or the constraints of an authoring system) dictate virtually every aspect of the design of the applications;

3) hypertext and hypermedia can be effectively delivered on readily available computing and peripheral equipment of the caliber commonly available on campuses for student and laboratory use.

Yet, this level of practicality is still far short of what is sometimes proposed as a goal: tools that enable any instructor readily to create effective applications without professional assistance. This goal has seemed attractive — or even necessary — to realize the full potential of computing to enhance instruction since the precise needs of one instructor rarely match the capabilities of another's software. Our experience over the past couple of years with the projects described here suggests to us an alternative to this "ultimate

tool" route to widespread effective use of software to enhance instruction.

First, it appears that professional programming will continue to be an important component of the development of new instructional software, and especially of software that is to be used in several contexts. Whatever the programming tools, reliable software which can be maintained requires more than ad hoc solutions. Moreover, we repeatedly find that we need to make use of sophisticated programming tools in order to make applications follow academic design; "authoring tools" all require a redescription of presentation of material within a confining model. Second, and more positively, we increasingly find instructors willing to use software which allows them to create presentations or lessons; such use is most obvious in the use of drill-construction programs which allow instructors to quickly create exercises or drills tailored to the materials in their courses. At Dartmouth, language instructors use at least three such drill-construction tools.

Our aim is to extend the scope of the software available to language instructors which can be used in this fashion, and the two examples described here suggest how this might be accomplished. Essentially, the idea is to share electronic versions of materials which are useful for language instruction — that is, the information itself rather than specific "lessons" or "instructional modules" — which can easily be put to alternative uses, and put together in arbitrary combinations. We have settled on plain text files for electronic texts but analagous simple portable formats need to be developed for glossaries, dictionaries, and other media. The software described for the linking of texts is intended to disappear from view as software per se; ideally it will appear to instructors and students alike as an extension of the standard interface, so that the "language workstation," as we describe this vision, is essentially a rich hypermedia environment in which lexical and other language tools, texts, video, and databases are available interactively.

Note: Hanzi Assistant *was created by a team of faculty, students and staff at Dartmouth College with academic leadership and content expertise from Huayuan Li Mowry and*

Susan Blader, Professors of Chinese Language and Literature. Software development and data entry were partially supported by the Consortium for Language Teaching and Learning, Apple Computer, and the Charles E. Culpeper Foundation. Hanzi Assistant *is available on CD-ROM from Panda Software, 101 Bartlett Hall, Hanover, NH 03755.*

The work described as a schema for interactive reading has been carried out in collaboration with numerous others, particularly Otmar Foelsche, Manager of the Language Resource Center, Bruce Duncan, Professor of German, Steve Maker, Manager of the Courseware Development Group, all at Dartmouth, and Kurt Fendt of the Abteilung Für Angewandte Linguistik at the University of Bern, Switzerland. Discussions with participants in the Language Workstation project have also been important, particularly Frank Ryan of Brown University and Judith Frommer of Harvard University. The preliminary software implementation illustrated here has been carried out by Michael McClenne, Susan Tenney, Robert Brown, and Steve Maker of Dartmouth. Software development was supported by Dartmouth College, the Clarles E. Culpeper Foundation, the Sears Foundation, and the Consortium for Language Teaching and Learning. The Language Workstation project is supported by the Consortium for Language Teaching and Learning.

Interactive Audio and Computer-Assisted Language Learning

Randall L. Jones

When the microcomputer began to emerge as a tool for learning a second language, critics charged that computer lessons were no more than electronic versions of conventional exercises. At a time when the profession was encouraging real language communication, especially speaking and listening, the computer was moving us in the opposite direction, offering manipulation of grammatical structures and rote memorization of individual vocabulary items. Students who spent time with the computer would experience a little reading, a little writing, and a lot of selecting *a*, *b*, *c*, or *d*.

While this criticism may have been an exaggeration of what was actually being done, it was nevertheless an irony that so much attention was being directed at a device that was supposed to assist in the learning of a language, but which itself could not produce or understand speech. Those with vision pointed out that the microcomputer was, relatively speaking, in its infancy and that, in the near future, it would certainly be able to communicate using natural spoken language.

In the intervening years the computer has indeed developed the ability to speak, at first using crude synthesized speech technology as well as various kinds of computer-controlled recording devices. (Jones 1989) More recently, digitized audio has become a fairly common component of microcomputers, especially those designed for use in education. Its high quality, ease of use, and relatively low cost make it an ideal tool for computer-assisted language learning. Unlike audio on a cassette tape, digitized audio segments can be accessed immediately, making it possible from within a lesson to select one of literally hundreds of spoken sentences and have it played instantaneously. Even the

same sentence can be repeated indefinitely without any delay.

Digitized audio has, of course, been available for several years in the form of compact discs, popular primarily for musical recordings. A digital recording differs from a conventional or analog recording in that instead of capturing the complete sound waveform, a series of periodic samples is taken, each of which can be stored as a single byte. This is known as analog to digital or A/D conversion. The total representation of the audio signal can then be stored and processed very much like any other digital data. The output of the reverse process, D/A conversion, can be channeled through a standard audio device to reproduce the sound. The quality of the sound depends on several factors, the most important of which is the sample rate per second, expressed as kiloHertz (kHz). A sample rate of 5 kHz is adequate for AM radio quality voice, while a rate of 44 kHz is needed for stereo quality music. For most language learning programs, a rate of 11 kHz is recommended. A higher sample rate results in a higher quality recording, but it also requires more space for data storage.

During the past few years, a number of digital audio devices for the microcomputer have appeared on the market. The remainder of this chapter will focus on two of these: Audio Visual Connection for MS-DOS compatible machines and the *MacRecorder* for the Apple Macintosh. Both products are relatively simple to use. They are similar in some ways, but each has its own set of unique features.

The recently released Audio Visual Connection (AVC) from IBM provides excellent capability for using audio with computer-aided language learning. In addition to a video-capture card, the software includes an audio-capture and playback board which occupies a slot in the microcomputer. Although AVC was originally designed as presentation software, it has many useful features for computer-assisted learning. It is possible to record, edit, and play back monaural and stereophonic sound from a variety of sources. The recording can be made at 5.5 or 11 kHz. For playback, either headphones or a speaker with an amplifier can be used.

After an audio segment has been recorded, it can be edited

in much the same way as a written text is edited with a word processor. Segments as short as a tenth of a second can be deleted or copied and pasted somewhere else. The audio can be synchronized to occur with other objects in the lesson, and a second audio object can be added, e.g., music or street noise. The volume can also be controlled for any part of the segment and special effects such as fade-in and fade-out can be used. At any time the audio objects of a lesson can be edited. New audio can be added and existing audio can be reduced or deleted.

Figure 1: Map of German speaking countries (from Crean, John E., Jr., et al. *Deutsche Sprache und Landeskunde*. New York: Random House 1985).

In a recent application, I used AVC to teach students about regional variations of modern spoken German. A map of the Federal Republic of Germany, the German Democratic

Republic, Austria, and Switzerland is displayed on the screen with approximately thirty cities identified.Using a mouse, a student can click on any of the cities, then hear a brief segment of speech taken from an interview with a native speaker from that city. The speaker does not use dialect, but rather the colloquial language that is typical of the region, i.e., what one would hear in a store, a restaurant, or simply when asking for directions on the street. With very little effort, students of German can be exposed to numerous examples of authentic spoken German from all of the German-speaking countries. They can have the spoken segment repeated as many times as they wish, then request to see a written version or obtain assistance with vocabulary, grammar, and so forth.

The Macintosh has an audio-to-digital converter with speaker and headphone jack already built into it. In order to record, however, it is necessary to purchase a third-party system such as *MacRecorder*. The complete system consists of an external digitizer with a built-in microphone, microphone jack, line jack, and volume control and attaches to the Macintosh via the modem or printer port. The system includes two software packages, *SoundEdit*, for editing, processing, and mixing recorded sound segments, and *HyperSound*, for recording sound segments to be used with *HyperCard* programs.

With *MacRecorder* the sample rate can be set at 5.5, 7.3, 11, and 22 kHz. After a sound has been recorded, *SoundEdit* can be used to edit the sound in a variety of ways (e.g., delete part of the signal, dub new sound into the signal, add other sounds, change the volume, pitch, or speed of the segment, play all or part of it backwards, filter out unwanted sounds, add an echo or other special effects, etc.). The resulting sound can then be copied into a *HyperCard* stack or used by other Macintosh applications.

HyperSound is used in conjunction with *HyperCard*. It is designed for recording sounds and copying them to *HyperCard* stacks without the need to edit or otherwise use the extensive features of *SoundEdit*. It is simple to use and is probably adequate for most CALL applications.

The variety of lessons that are possible using digitized

audio are almost limitless. Pronunciation, listening comprehension, and dialect study are now viable objects of study in CALL. With the added dimension of high quality, immediately accessible, authentic speech, the computer can no longer be accused of being nothing more than an expensive electronic workbook.

Multimedia and Listening Comprehension

James S. Noblitt

Listening comprehension is a particularly difficult skill to acquire when the student is removed from the foreign language environment. Formal or classroom instruction typically does not provide enough time for the learning event to take place spontaneously. The learning that does occur may be marked by artifacts of the teaching environment, such as dependency on the instructor's voice, an artificially slow rate of speech, or support from a written script. Listening comprehension tapes offer a marked improvement over text-based learning, but many students are unable to use recorded material effectively, complaining of boredom, fatigue, and lack of meaningful interaction.

Bernard Petit, an instructor in French at the State University of New York at Brockport, addressed these problems by making his own videotapes abroad with a hand-held video camera, recording scenes and samples of speech that would both relate to his syllabus and interest his students. His videotapes have been successful in providing both visual support and general context for spoken French in the classroom. These tapes have been adopted for use with textbook material and are distributed by Heinle and Heinle Publishers of Boston. Problems remain, however. How is the student to gain access to videotaped materials for rehearsal? What evidence is there that watching taped material actually addresses the central problem of listening comprehension, that is, the ability to interpret novel and unexpected messages?

With assistance from the Institute for Academic Technology at the University of North Carolina, Chapel Hill, Petit and I decided to use IBM's Audio Visual Connection sound and video capture boards, along with the authoring program, to create materials based on his video tapes. His publisher provided a videodisc of selections from his work, and we created

a prototype lesson using the multimedia capabilities of AVC. We define multimedia instruction as a technique that combines images, sound, and text with interactive control by the student. A computer-aided approach to listening comprehension would be justified, we believed, if each of these elements were integrated so as to arouse interest and provide a meaningful learning environment.

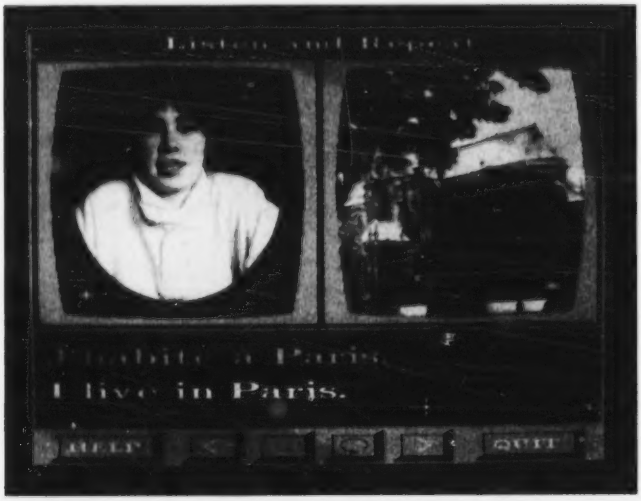
Our purpose was to devise techniques for sustaining the acquisition of oral language skills outside of the classroom. Those who do not understand authentic samples of foreign language spoken at normal speed cannot be told to listen harder, or listen faster. The key to successful comprehension is learning how to construct meaning from what is heard. In other words, listening comprehension depends on what has been termed "analysis by synthesis." In this model, the student must generate from contextual clues a probable message that may be either confirmed or disconfirmed by closeness of fit with the actual phonetic utterance and what is already known about the language. Once what is heard is understood, it may be rehearsed and stored so as to expand the repertoire of expected utterances. Multimedia materials should therefore serve to integrate the cognitive and behavioral aspects of verbal comprehension by supplying contextual support for what is being said as well as the means for confirming and rehearsing the content.

We arrived at the following guidelines for creating listening comprehension exercises:

Authentic samples of speech were presented so that students at the beginning level would learn to expect variation in age, gender, and dialect as well as to cope with background noise and normal rate of speech. Accordingly, we used Petit's materials to sample a variety of speakers of French from Paris, the Midi, Switzerland, Canada, North Africa, etc. Each frame of the lesson produces a new voice explaining, for example, where the person lives: *J'habite à Paris, ...Québec, ...Nice*, etc. Interest derives from the diversity of voices and regional accents.

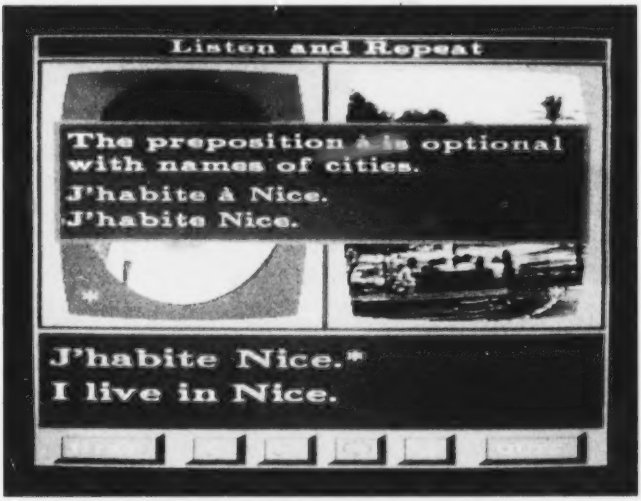
Images that evoked the context of an utterance were used to assist students in determining what the message was likely to be. (If students had previously seen the full-motion

sequence in class, the stills would have the added benefit of evoking a situational or narrative context.) A typical frame juxtaposes a picture of the speaker and a picture of a landmark representative of the place of origin.



Students *interact* with the program by clicking on buttons at the bottom of the screen so as to have comprehension aids on demand. Accordingly, in addition to the authentic sound sample and supporting images, we recorded background information on the person and place of origin to assist in formulating the probable meaning of the utterance. (Some users of the program report that the authentic sample seems slower after this material is heard!) One uses a mouse to click on a picture for information, and this provides a natural channel for learning about cultural diversity in the francophone world. Since the display of information is query-driven, students receive instruction in the context of their own attempt to understand. That is, they are in discovery-learning mode rather than reception-learning mode. If there is still a problem in comprehension, access to written support is provided along with a normalized version recorded under studio conditions. Access to support functions is controlled by a layered button that changes appearance as each

layer is taken off: key word or phrase, complete transcription, translation. If comprehension occurs without extra help, the student may proceed directly to the next frame.



The program runs on relatively inexpensive workstations, since an ordinary VGA color or black and white screen suffices to display images of near photographic quality, an inexpensive sound card provides the audio source for each workstation, and a pair of earphones and a mouse supply the peripheral support. We found the speed of interaction good on a 386 machine. Learners work at their own pace, since the digitized sound and images are stored for immediate retrieval on the hard disk or on a central file server. We estimate that material for a 20-30 minute listening comprehension lesson requires about a megabyte of storage.

The underlying design was developed in *template* form, so that the content may be supplied from any suitable audio or video source by simply indicating the appropriate digitized files in the Audio Visual Authoring script language for the AVC. (Our programmer, Scott Burchill, provided variables in the program for this purpose.) Accented (upper ASCII) characters are supported and editing textual material is relatively simple. Graphics support is also good, allowing us to create

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and experiment quickly with buttons and other virtual manipulanda to test the design features of the interface. Hypertext links provide the random access needed to support query-driven information retrieval. A picture serves as a focal point while the learner repeats the sample, calls for a recorded cultural note, or consults a written grammar note relevant to a comprehension problem. Our design and prototype lesson took less than a week to put together; with a lesson template and videodisc of material available, it is possible to produce lessons very quickly.

There is no doubt that multimedia materials can play a role in providing an interesting learning environment for listening comprehension. It may sound odd to stress the visual elements in hearing, but comprehension is aided enormously by being able to see gestures, expressions, and elements of the surrounding environment. (Using the telephone in a foreign country is considered a particularly difficult test of language ability, precisely because sound is the only channel of communication.) User controlled access to digitized images, voices, and textual material offers a practical and effective way to integrate the elements underlying a complex skill.

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Randall L. Jones is a Professor of German at Brigham Young University. For nine years he served as director of BYU's Humanities Research Center, where he was involved in applications of technology to research and instruction in various aspects of the humanities. He has made numerous presentations and published widely in the field of language and technology. He is currently the Executive Secretary of the Association for Computers and the Humanities.

James S. Noblitt received a B.A. and M.A. degree in French Literature at the University of Virginia and spent a year in Paris as a Fulbright Scholar. He received a Ph.D. degree in French linguistics from Harvard and spent two years at the Center for Applied Linguistics. He joined the faculty of Modern Languages and Linguistics at Cornell in 1967 where he has headed the French language program and given courses in medieval French and applied linguistics. He is the author of an introductory text for college French, *Nouveau Point de Vue*, and co-author of a program for writing assistance in French, *Système-D*, which won the 1988 EDUCOM/NCRIPTAL award for Best Foreign Language Software. He is currently on leave from Cornell as a Fellow at the Institute for Academic Technology, the University of North Carolina at Chapel Hill, where he is exploring the role of information technology in language teaching and learning.

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